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Redescription of *Mycorrhaphium pusillum*, a poorly known hydnoid fungus

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Abstract — The hydnoid basidiomycete *Mycorrhaphium pusillum* was found in Finland. There are only a few records of the species globally, and the genus *Mycorrhaphium* has not been recorded previously in northern Europe. Here we report a detailed description of the macro- and microscopy of this poorly known species and publish the first photographs of it, accompanied with detailed microscopic drawings.

Key words —*Mycoleptodonoides*, *Steccherinaceae*, wood pasture

Introduction

During our extensive fungal surveys on Finnish wooded pastures we found a hydnoid basidiomycete species, *Mycorrhaphium pusillum* (Maas Geesteranus 1962), from one site in southern boreal vegetation zone. There are no previous records of the genus *Mycorrhaphium* in northern Europe. On three occasions (August 2012; August 2013; August 2014), a single sporocarp was observed growing in the very same location. Every time we conducted a very thorough survey of the surroundings, yielding no additional sporocarps in 2012 and 2013 but finding one additional sporocarp some meters from the original location in 2014. Here we report our findings. First we describe the growth site to increase the knowledge of the habitat requirements of this rare fungus. Then we describe the species in more detail than in the original description and discuss its systematic position.

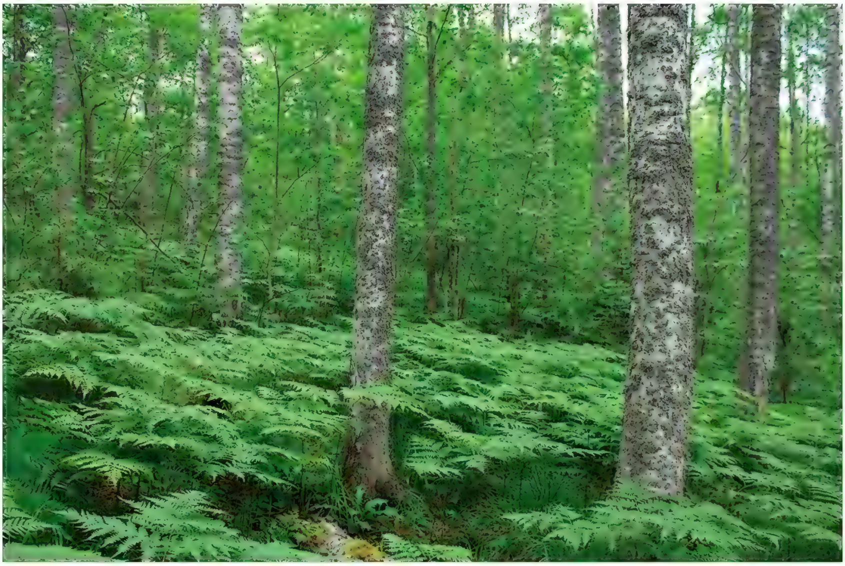

FIGURE 1. *Mycorrhaphium pusillum*. Growth site in Luhanka, Finland. Photograph by Kaisa Tervonen.

Site description

The site is a nutrient rich herb-rich forest dominated by broadleaf tree species (FIG. 1); *Betula* spp. predominate, but *Alnus incana* (L.) Moench, *Salix caprea* L., *Pinus sylvestris* L., *Picea abies* (L.) H. Karst., *Sorbus aucuparia* L., and *Rhamnus frangula* L. are also present. The site is influenced by calcareous soil. For example the presence of *Russula aurea* Pers. as well as the abundance of *Craterellus sinuosus* (Fr.) Fr. and the orchid *Listera ovata* (L.) R. Br. indicates high soil lime content (Nitare 2000, Mossberg & Stenberg 2005). The site was slash-and-burn cultivated in the late 19th century and then utilized as a wood pasture for cattle, probably until the 1970s when it was abandoned; most recently the area is protected as a habitat of an endangered bird species, white-backed woodpecker (*Dendrocopos leucotos* Bechstein). The site hosts especially rich community of rare fungi, including some wood-inhabiting polypores (Halme 2008; Markkanen & Halme 2012) as well as ectomycorrhizal and litter decaying agarics (Tervonen & Halme, unpublished).

Within a ten meter radius of the growth site the most frequent vascular plant species were *Pteridium aquilinum* (L.) Kuhn, *Calamagrostis arundinacea* (L.) Roth, *Hepatica nobilis* Schreb., *Alnus incana*, *Rubus saxatilis* L., *Vaccinium myrtillus* L., *Geranium sylvaticum* L., and *Cirsium helenioides* (L.) Hill. The most frequent agaric species producing fruit bodies in the same patch were *Lactarius glyciosmus* (Fr.) Fr., *Cortinarius casimiri* (Velen.) Huijsman, a species of *Cortinarius* sect. *Anomali* Bidaud et al., *Laccaria laccata* (Scop.) Cooke, *Inocybe geophylla* (Bull.) P. Kumm., *Psathyrella senex* (Peck) A.H. Sm., *Galerina triscopa* (Fr.) Kühner, *Mycena flavoalba* (Fr.) Quél., *Mycena galericulata* (Scop.) Gray, and *Mycena pura* (Pers.) P. Kumm.

Methods

Microscopic measurements were made using Olympus and Leica light microscopes with up to 1600× magnification. Microscopic techniques follow Miettinen et al. (2012b). Measurements are based on Finnish specimens of *M. pusillum*. Voucher specimens are deposited in the Botanical Museum, University of Helsinki, Finland (H) and the Herbarium, University of Jyväskylä, Finland (JYV).

Species description

Mycorrhaphium pusillum (Brot.) Maas Geest., Persoonia 2: 398. 1962. FIGS 2, 3

BASIDIOCARPS annual, stipitate, leathery, solitary or fusing together (2–3 caps on common stem). Caps 12–19 mm in diam., evenly rounded and applanate to

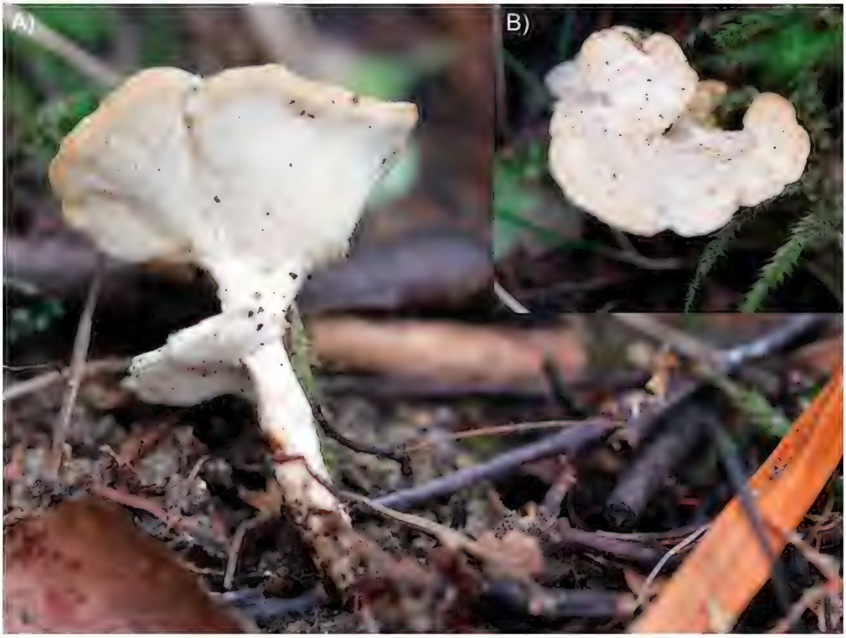

FIGURE 2. *Mycorrhaphium pusillum* (JYV, Tervonen 3113). Sporocarp: A. from below, illustrating the spines and stipe; B. from above, illustrating the cap surface. Photographs by Kaisa Tervonen.

asymmetric-flabelliform, pale cream-colored to pale ochraceous, sometimes with pale brownish zones; margin sharp, even, fertile. Stem 15–21 mm long and 1–3 mm thick, central or excentric, pale cream. Spines acute, slender, sometimes fusing together, 0.8–1.2 mm long, 7–8 per mm, tough, pale cream to pale ochraceous. No distinct smell.

Hyphal structure dimitic in spines, monomitic in context; hyphae hyaline, faintly cyanophilous.

Context. Hyphae relatively loosely arranged, with thickened walls, simple-septate, with clavate terminal portions forming a layer on pileal surface ("trichoderm"), 3.2–4.8 µm in diam., some inflated up to 7 µm in diam. (n = 10/1).

Spines. Tramal skeletal hyphae distinctly thick-walled to subsolid (with capillary lumen), parallel and densely arranged, some with adventive septa, (3.1–)3.7–4.9(–5.0) µm in diam. (n = 20/1); tramal generative hyphae with distinct walls, clampless, 2.5–3.5 µm in diam. Subhymenium distinct (10–15 µm thick), consisting of thin-walled, short-celled, clampless generative hyphae 2–3 µm in diam. Gloeocystidia rare, clavate, of subhymenial origin, embedded in basidial layer, 10.1–11.3 × 4.3–5.4 µm. Hyphal pegs infrequent, 10–15 × 15–20 µm, consisting of short-celled clampless hyphae 4.1–5.7 µm in diam. Basidia clavate, 1–2(–4)-sterigmatic, clampless, 9–14 × 3–4 µm.

Basidiospores thin-walled, thick cylindrical, with more or less flattened ventral side, tapering to the apiculus, (2.7–)2.9–3.6(–3.8) × (1.8–)1.9–2.2(–2.3) µm, L = 3.03, W = 2.00, Q' = (1.3–)1.5–1.7(–1.7), Q = 1.52 (n = 60/2), usually with a prominent oil-drop, inamyloid, acyanophilous.

Habitat—In herb-rich forest dominated by *Betula* spp., on mossy, knotty mull ground. No certain connection with wood was detected.

Specimens examined: **FINLAND. Etelä-Häme:** Luhanka, Kuruvuori, on ground, 18.VIII.2012, Mustola 1618 & Toivonen (H); 30.VIII.2013, Tervonen 3113 & Sundström (JYV, H). **ITALY. Piedmont:** Turin, Cantalupa, on wood of *Fagus sylvatica*, 11.III.1984, Bernicchia 2400 (H).

Discussion

Mycorrhaphium Maas Geest. is now accepted as a small genus comprising both stipitate and sessile hydnoid fungi, and it was shown to be a member of the *Steccherinaceae* (Miettinen et al. 2012a). According to some sources (www.indexfungorum.org), *Mycorrhaphium* is regarded as a synonym of *Mycoleptodonoides* Nikol., typified with *M. vassiljevae* Nikol. (Nikolaeva 1952), an East Asian species with a monomitic hyphal structure and allantoid basidiospores. The author VS studied the holotype of *M. vassiljevae* (Herb. LE) as well as some additional collections from the Russian Far East. *Mycoleptodonoides vassiljevae* is a monomitic species having wide, clamped hyphae (in contrast to

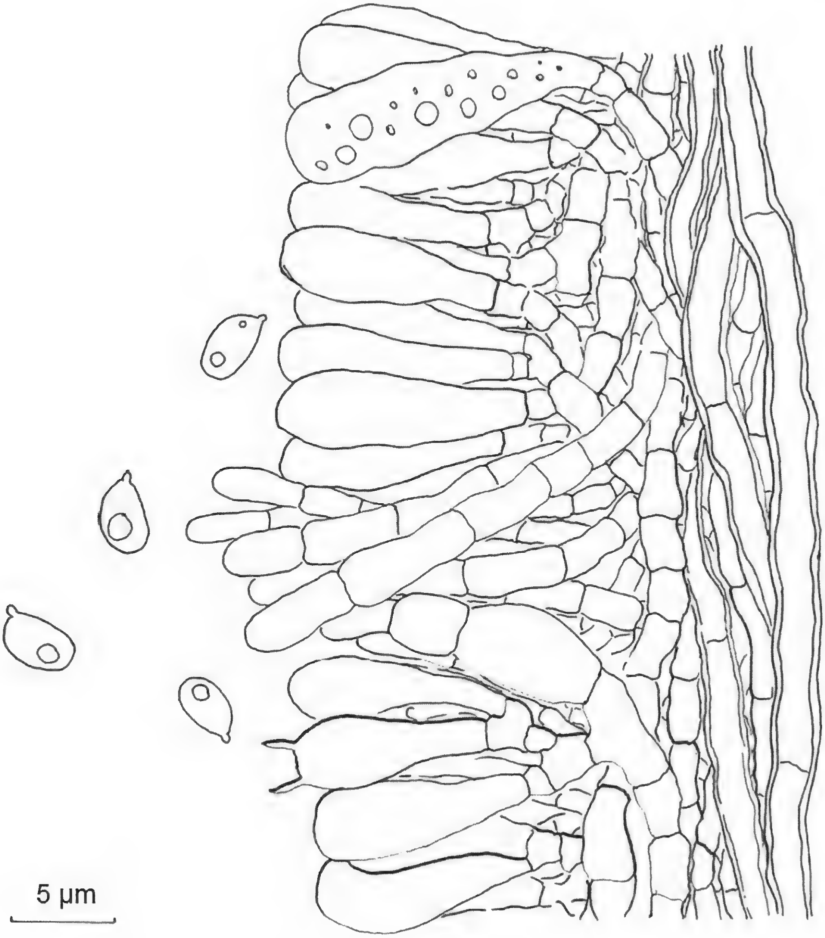

Figure 3. *Mycorrhaphium pusillum* (H, Mustola 1618).
Skeletal and generative hyphae, basidia, gloeocystidia, and basidiospores.
Drawing by Viacheslav Spirin.
[The characters match the second collection (Tervonen 3113) from the same site.]

clearly dimitic basidiocarps of the *Mycorrhaphium* species); in addition, it has neither the gloeocystidia nor hyphal pegs characteristic of all *Mycorrhaphium* species studied by us (including the generic type, *M. adustum* (Schwein.) Maas Geest.). Thus we accept the opinion of Maas Geesteranus (1961, 1962) that *Mycoleptodonoides* and *Mycorrhaphium* are two independent, seemingly not closely related genera. Here we follow the generic concepts proposed by him and consider all dimitic species (including *M. pusillum*) as members of *Mycorrhaphium*. The taxonomic position of *Mycoleptodonoides*, which is still unclear, will be clarified in further DNA-based studies.

Mycorrhaphium pusillum is quite small, but easily recognizable and visible and probably not readily confused with any other species. Still, our record is the only one in the whole of northern Europe, and *M. pusillum* has been found only a few times in central and southern Europe. The site where we recorded the species is regionally quite unique regarding the stand quality and species assembly, suggesting that *Mycorrhaphium pusillum* may be very demanding in its environmental requirements. Consequently, we believe that this species is truly rare instead of just being overlooked.

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